CTPP Status Report

U.S. Department of Transportation
Federal Highway Administration
AASHTO Standing Committee on Planning

TRB Census Subcommittee
Bureau of Transportation Statistics
Federal Transit Administration

Census Transportation Planning Products (CTPP) Highlights

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CTPP data are released!

The 2012 to 2016 CTPP five-year small area data product has been delivered, developed, and disseminated. To access the new data, go to: *https://ctpp.transportation.org/2012-2016-5-year-ctpp/*.

The Oversight Board, headed by Jessie Jones of the Arkansas Department of Transportation (DOT), is busy with several activities covering research, training, and outreach to support the new CTPP data set.

The CTPP Ongoing Technical Service Program has issued a solicitation to State DOTs for a $5.6 million five-year funding package to cover 2020 to 2024. The solicitation was mailed on October 10, 2018, with a request for a contact, commitment, and payment by the end of this fiscal year (July 2019). The CTPP asks the States for funding in advance of data delivery because the Census Bureau requires advance payment. Out of the 51 State DOTs, 27 have committed to the program, and 17 States have paid part or in full as of April 12, 2019. As in previous solicitations, the assessment is population based, can be paid with SP&R funds, and the requirement for local match has been waived by Federal Highway Administration. Please reach out to your State DOT and ask them to support this valuable effort. All previous solicitations had nearly full participation for the 50 States and District of Columbia, and we anticipate the same participation for this one.

CTPP Data Access Software is New and Improved!

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AASHTO released the 2010–2016 CTPP on April 2, 2019, with more data mapping features. The United States Census Bureau delivered the special tabulation of five-year small area data to AASHTO in December 2018. The dataset consists of the following tables and data for over 325,000 geographies:

- 114 residence-based tables.
- 56 workplace-based tables.
- 24 flow table for home to work.

Demographic characteristics include in each of these tables age, race, sex, earnings, income, employment status, industry, occupation, household size, vehicle availability, and a host of others; not the least of which is means of transportation to work!

The data are derived from two American Community Survey (ACS) microdata record sets based on the 2012–2016 ACS. One set is the original microdata: all tables derived from this set are designated A. The other set is a disclosure proofed microdata set; all tables derived from this set are designated B. That is to say, the first letter in the table

name indicates the set from which the table was derived. For more information on disclosure proofing, please access the CTPP e-Learning module, "Disclosure Proofing" at: http://ctpp.training.transportation.org/.

The CTPP Data Access Software is a powerful tool. Users can view results as charts and tables then, and refine them to suit their needs. It includes a robust mapping tool used for both selecting geography and rendering results. Data from the tool can be downloaded as comma or semicolon delimited .csv, .xml, .shp, and .tab. Figure 1 shows the screen users will see when they log in.

Figure 2 below shows more detail, along with a brief description of each highlighted area.

- **Box 1** is the main menu. Use it to log in; search the tables by table number, phrase, keyword, or variable; find help; and access the tutorials. A CTPP feedback form also is available to report a bug or problem with the software. Please register with an email address and a password to enable saving of selections.
- **Box 2** is the table folder; click on it to fully expand the folder structure for residence-based tables (see Figure 3 below).
- **Box 3** is Geography selection; geography can be selected before or after a data table, by a list, through a map, or by drilling down into a table.

Figure 1. Software window

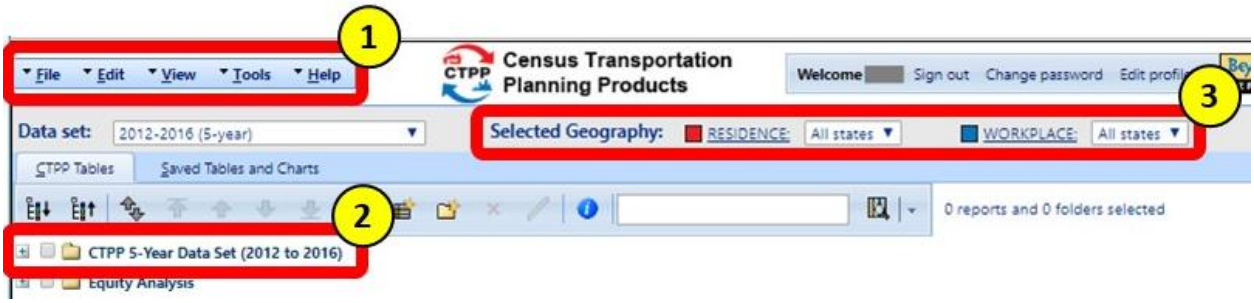

Figure 2. Software window (details)

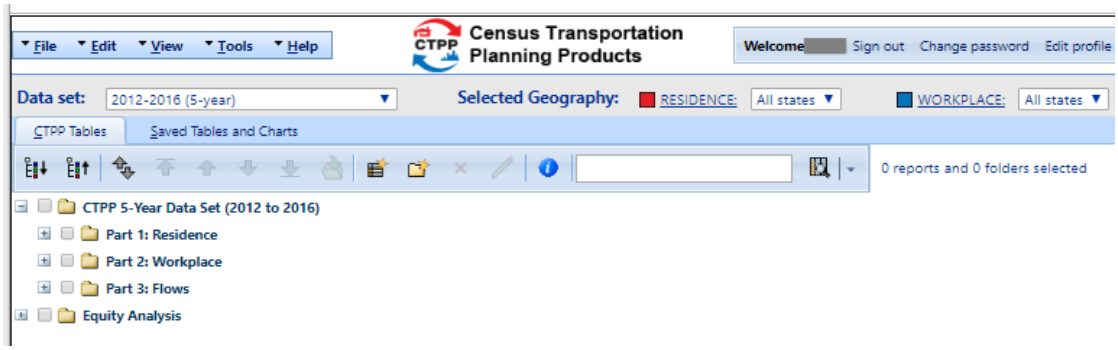

Figure 3. Expanded folder structure of Box 1

As an example, here are the steps and a visual (Figure 4) of how to select data for seven counties in New Jersey.

1. Click on the blue WORKPLACE, and click on Clear full selection button to clear the States that are selected by default.
2. Select POW State-County.
3. Click the dropdown list on selection panel.
4. Select the counties of interest, as shown in Figure 4.
5. See Figure 5 below to select the same data using the mapping tool. To get started, check the level of geography for county. Next, zoom to New Jersey and select the counties by highlighting them, or manually by using the selection toolbox.

The selected counties are shown on the right-hand side, as shown in Figure 6 below.

Users can zoom to the interested county using the "Zoom to…" tool, as shown in Figure 7.

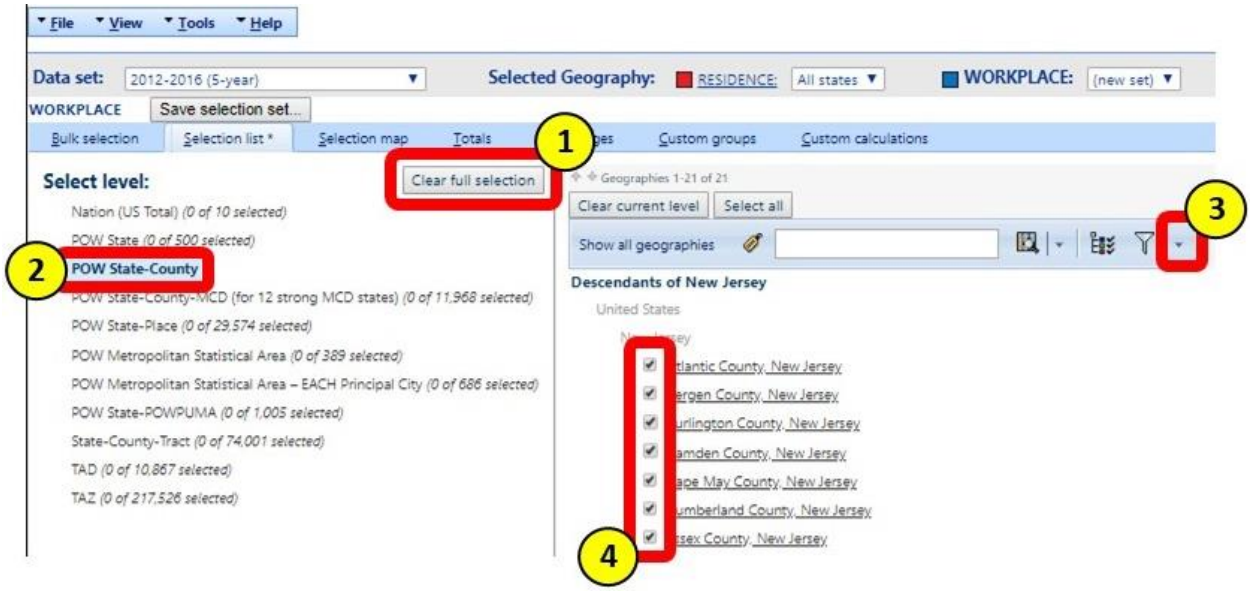

Figure 4. Selecting WORKPLACE geography example

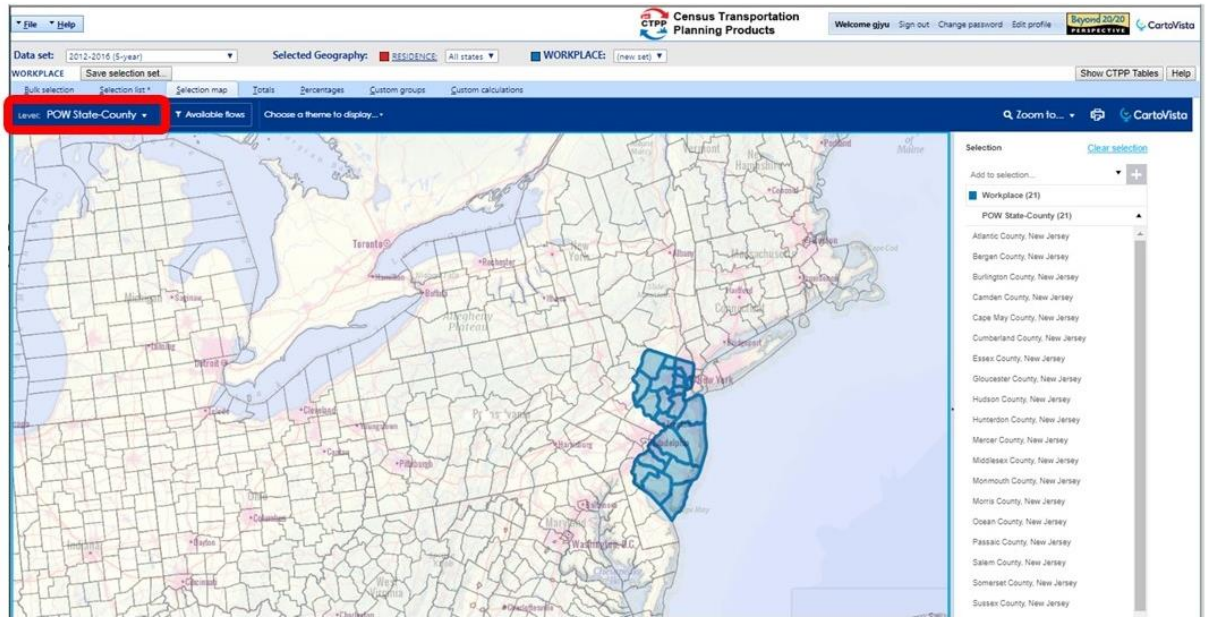

Figure 5. Selecting WORKPLACE using *Selection map*—map view

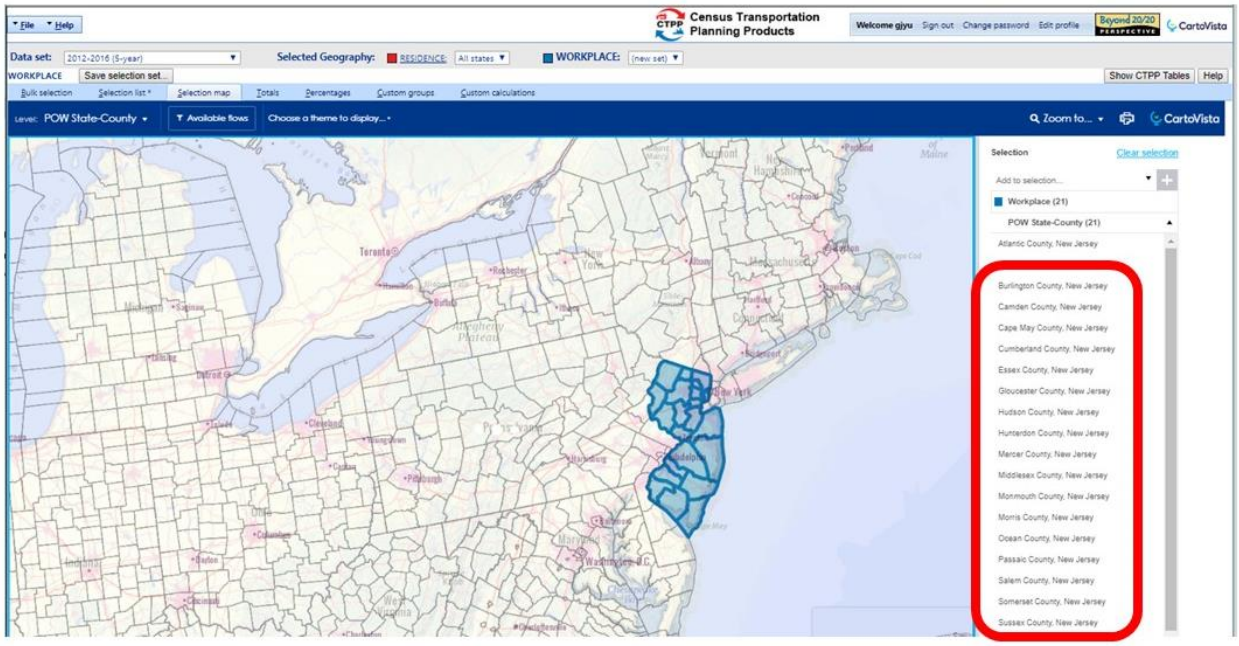

Figure 6. Selecting WORKPLACE Geography using selection map—selection list

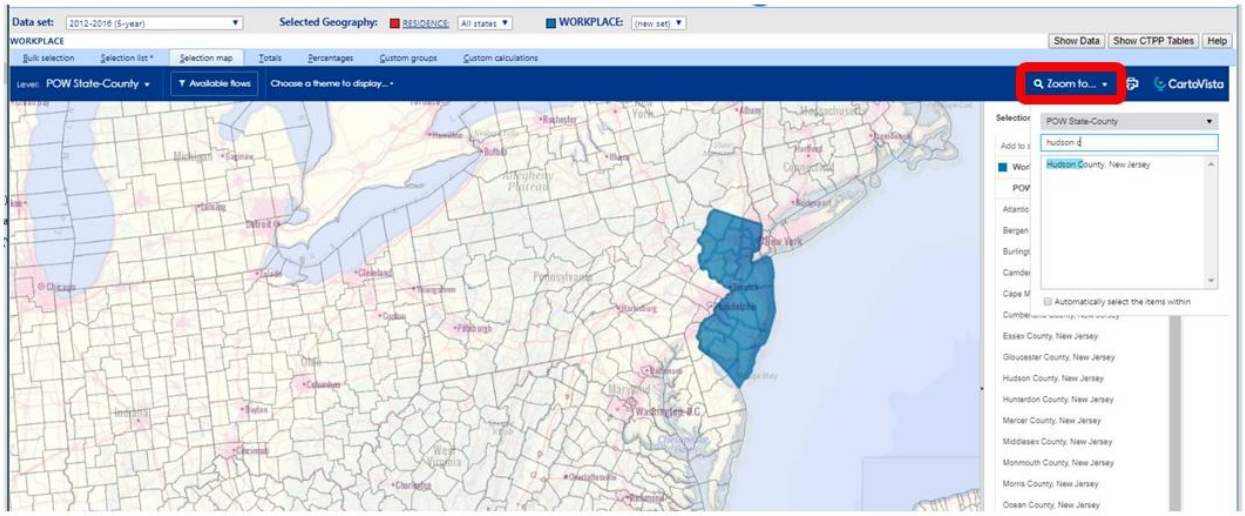

Figure 7. Selecting WORKPLACE using Selection map—zoom tool

To view the actual data, click Show CTPP Tables, and either scroll or search for A202100 (Figure 8).

Wow! Bergen County has almost one-half million workers, and the mapping tool shows the locations of the most dense employment centers. Drilling down to this level is possible by choosing tract-level geography, and then click on the Map button highlighted above in Figure 8. See Figure 9 below for how the data are presented on a map.

Figure 9 shows the highlighted tracts that have the most workers. The category definition can be fine-tuned using the feature highlighted in Figure 10 below.

A thematic map also can be used to visualize data in different ways and generate basic statistics.

The data access software is a powerful tool once you learn to navigate it. Tutorials, videos, cheat sheets, and live help also are available. If you have any questions on the data or access software, please contact *pweinberger@aashto.org*.

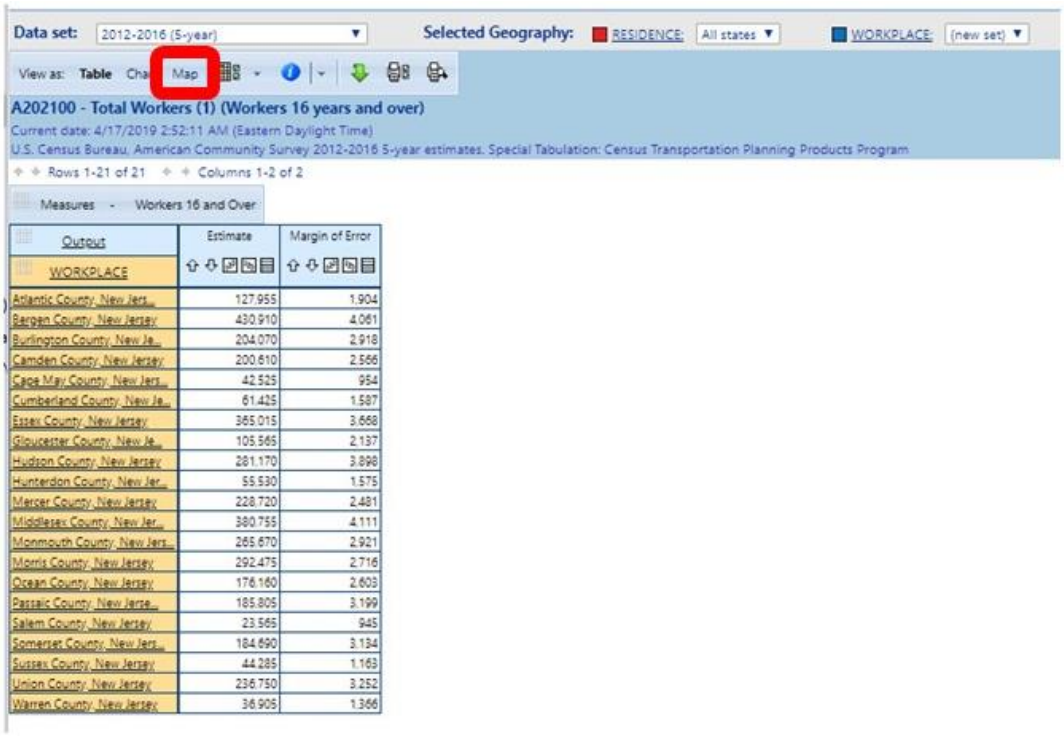

Figure 8. Software window after clicking Show CTPP tables

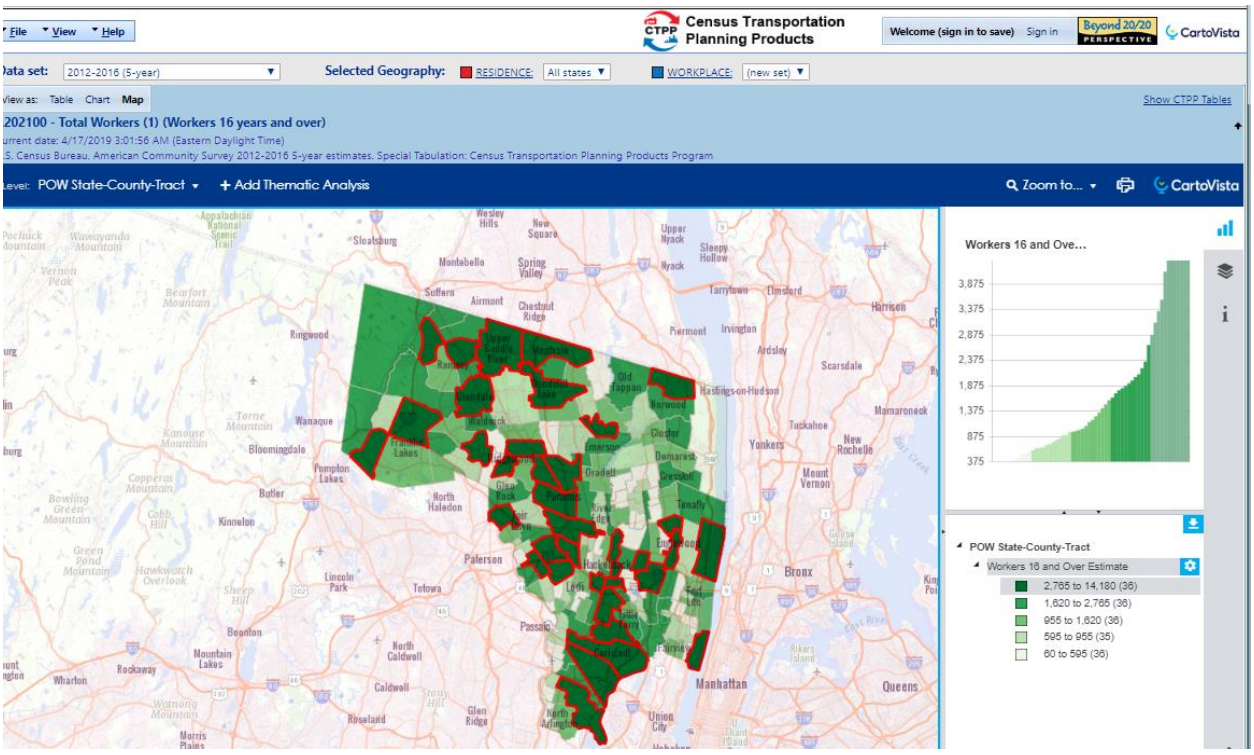

Figure 9. Map view after clicking Bergen County, New Jersey, and choosing tract level

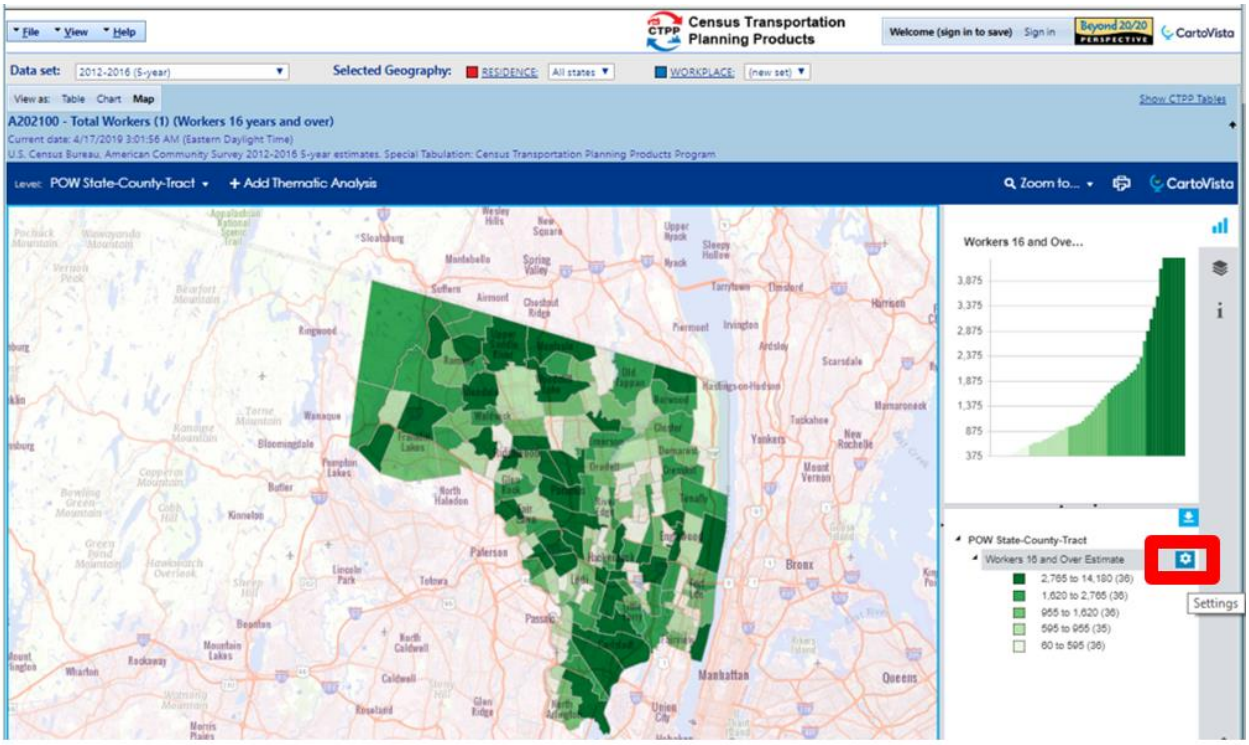

Figure 10. Map view after selecting Bergen County's tracks

Census Activities at TRB

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The Census Data Subcommittee held its annual meeting at the TRB Annual Meeting in January in Washington, DC. Topics included the new CTPP data set, updates on the PSAP program, the ACS Content Test, and visualizations of census data. Prior to the meeting, the Census Data Subcommittee sponsored a poster session, *Visualizing the Census: Innovations in Data Display*. It had seven posters covering topics from evaluating equity to modeling transit usage to using machine learning for crash analysis. The poster session was well attended and yielded a great opportunity for the poster authors to share their work. All of the posters are available on the subcommittee website: *http://www.trbcensus.com*.

At the subcommittee meeting, Kyeongsu Kim and Yohan Chang presented on the model in their poster, "GENESIS: Trip Generation Model Using ACS, CTPP, and NHTS Data," demonstrating how these datasets can be used for modeling trips. They provided a demonstration of the model for the Washington, DC region.

Other presentations at the Census Data Subcommittee meeting included an overview of the PSAP program, which currently is underway. The Census Bureau is partnering with local agencies across the country to update tract and block group boundaries in anticipation of the 2020 Census. Since Transportation Analysis Zones (TAZ) will not be a part of the Census Bureau's geographical programs in the future, it is very important for MPOs to work with the Census Bureau and their local planning partners to develop a comprehensive set of tract and block group boundaries that also can be used for transportation planning purposes.

Other discussion at the subcommittee meeting involved the Census Bureau's ACS Content Test and the future of the Journey-to-Work questions. For the upcoming Content Test in 2021, the Census Bureau will be testing the addition of "ride-hailing services" to the Taxi option for the Means of Transportation to Work question. If

successful, the change will be implemented in 2024. However, looking forward to the next Content Test, additional changes may be considered. Given the changes in technology, both existing and under development, with shared mobility and automated vehicles, there may be utility to changing the battery of questions on means of transportation, travel time, departure time, and work location. These questions have been in place since the 1980 Census. A robust discussion was had regarding the possibilities for the future of these questions. If you have any comments or suggestions to the future of the questions, please email Clara Reschovsky at the Bureau of Transportation Statistics (*clara.reschovsky@dot.gov*).

Generating Spatially Explicit Synthetic Populations to Understand Commute Mode Choices in a Metropolitan Area

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Understanding the factors and dynamics that substantially influence the transportation mode choices of residents living in a metropolitan area is important for urban designers, policymakers, public health specialists, and many other decisionmakers. Analyzing and understanding the impact of mode choice within a metropolitan area is a very complex nonlinear problem. We addressed the problem using a bottom-up approach (Park 2018): first, modeling the mode choice decisions of all synthesized individuals in a metropolitan area, and then aggregating their decisions in order to better understand the effects of different policy scenarios on mode choice. Unlike most existing approaches that simply focus on sociodemographic factors regarding transportation mode choices, our model explicitly integrated infrastructure data and a high-fidelity synthetic population in order to facilitate high-resolution simulations of commuters. To ensure the commuting process was realistically simulated, we created synthetic populations with detailed demographic characteristics and spatially explicit residential and workplace locations. This article summarizes how we created the synthetic population for New York City (NYC), and how it was subsequently used to evaluate the impact of different policy scenarios on choices of active commuting (i.e., nonmotorized) transportation modes.

Methodology for Creating the Synthetic Population

In this section, we describe the methodology we used to generate demographically detailed synthetic households and residents, as well as their likely places of work, for all NYC block groups defined by the Census in 2012 (US Census 2012).

Generating a Synthetic Population with Demographic Information and Residential Locations

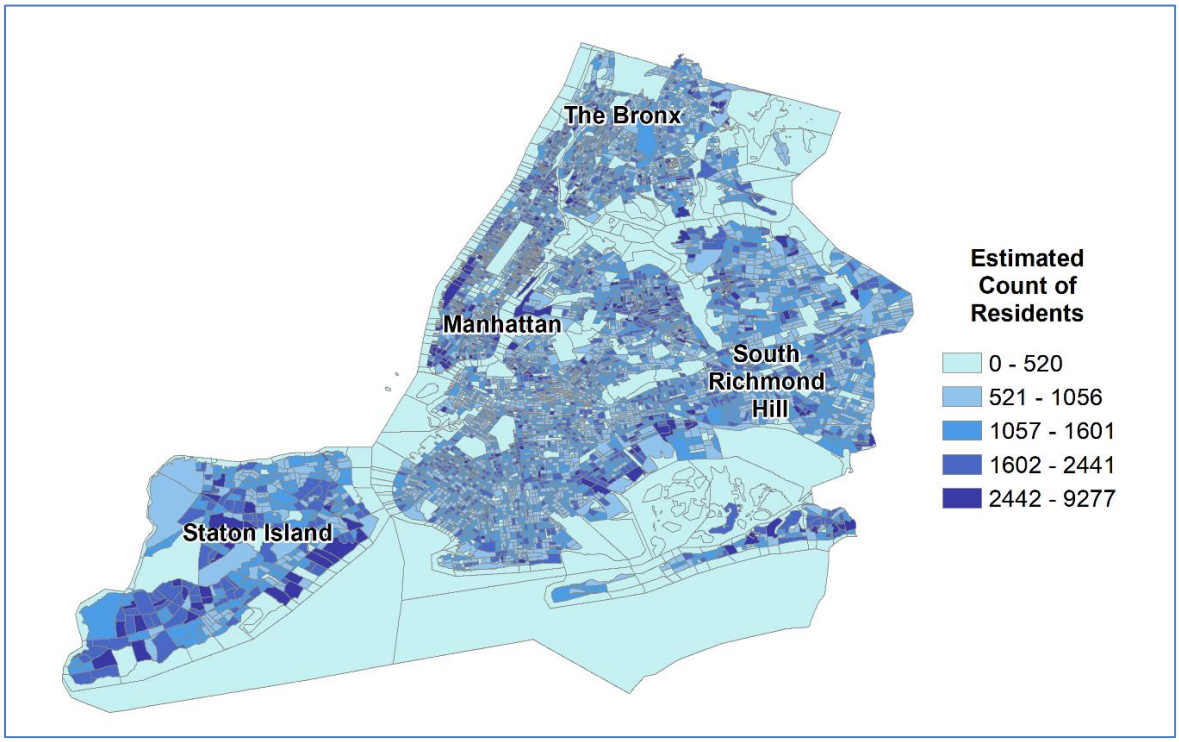
To generate demographically detailed synthetic households and residents for NYC, we applied the Penalized Maximum Entropy Dasymetric Model (PMEDM) proposed by Nagle et al. (2014). The PMEDM model is a population synthesizer that combines survey data with summary count data to synthesize realistic synthetic populations with demographic information and spatially explicit residential locations for each household and resident.

We parameterized the PMEDM model using the Public Use Microdata Sample (PUMS) of the American Community Survey (ACS) (US Census 2012) and 2008–2012 ACS summary tables (US Census 2012). We then applied it to NYC to generate a synthetic population of households and residents for all census block groups in NYC. Each simulated household and person generated by the model included demographic characteristics related to household size and structure; the number of vehicles belonging to each household; the number of children in

each household; and the age, sex, race, and industry of all residents in each household.

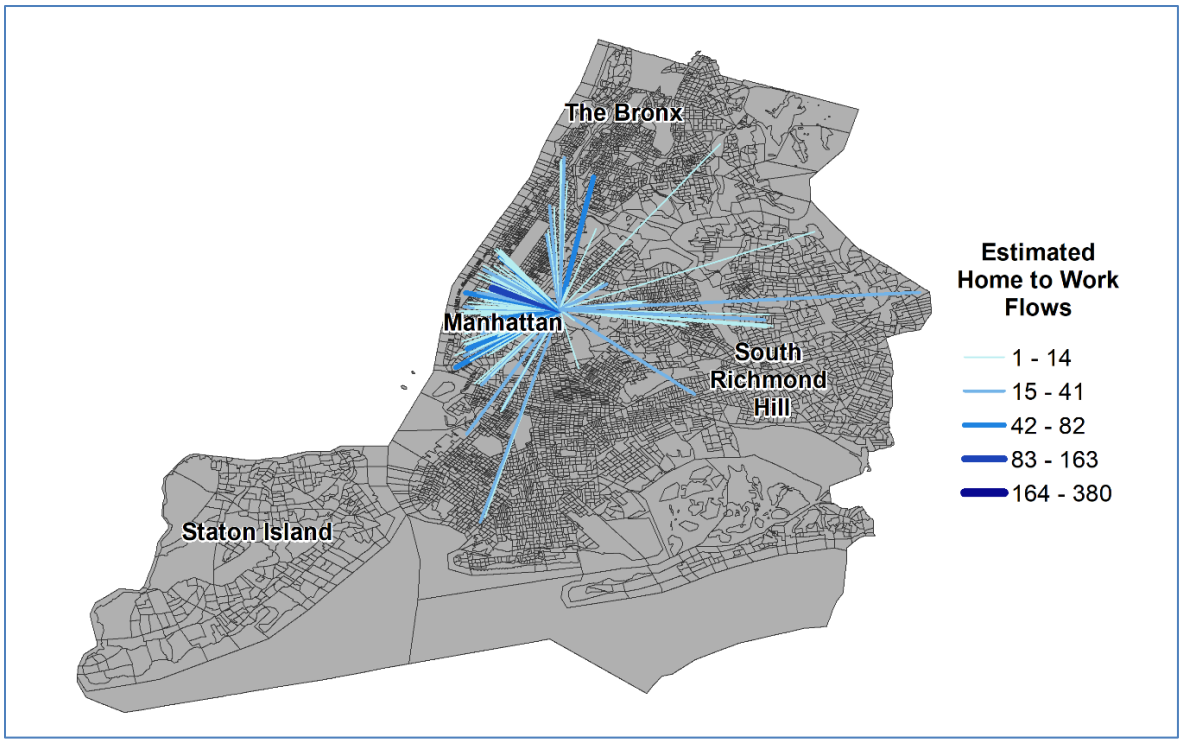
Generating Workplace Locations for Each Synthesized Resident

We next simulated likely workplace census block groups for each synthesized resident. To carry out these simulations, we applied the same approach proposed by Morton et al. (2017). More specifically, we combined the Census Transportation Planning Products (CTPP) journey-to-work tract-to-tract mean travel flows (CTPP 2010) with employment data provided by Pitney Bowes (Pitney Bowes 2010). For more details, please refer to Morton et al. (2017). This was done by converting each business point's North American Industry Classification System (NAICS) code to its corresponding CTPP industry code, and then summing over the number of employees working for each business in every industry and census block group. Figure 11 through Figure 16 illustrate characteristics of the produced synthetic population. On the map of NYC, Figure 11 to Figure 13 visualize residential locations, commuting flows, and workplace locations of the all synthetic population. Figure 14 to Figure 16 visualize those of females living in households with children and two vehicles.



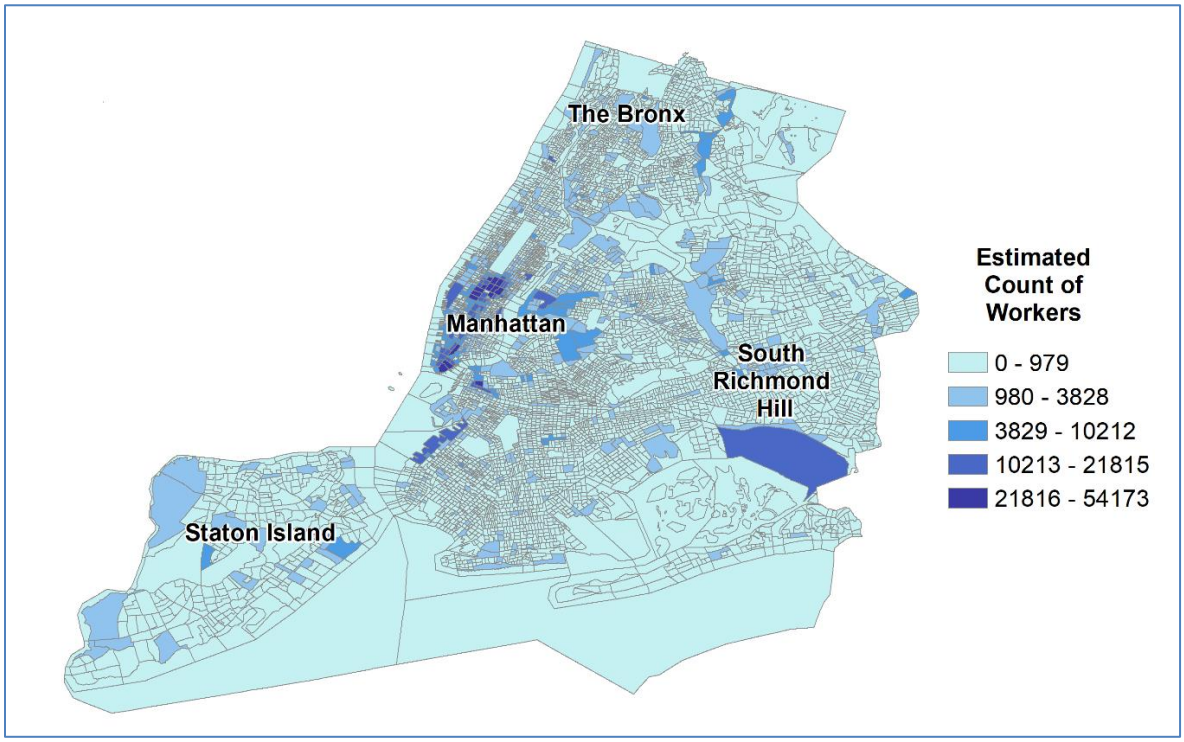
Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.

Figure 11. Estimated counts of residents living in NYC by census block groups



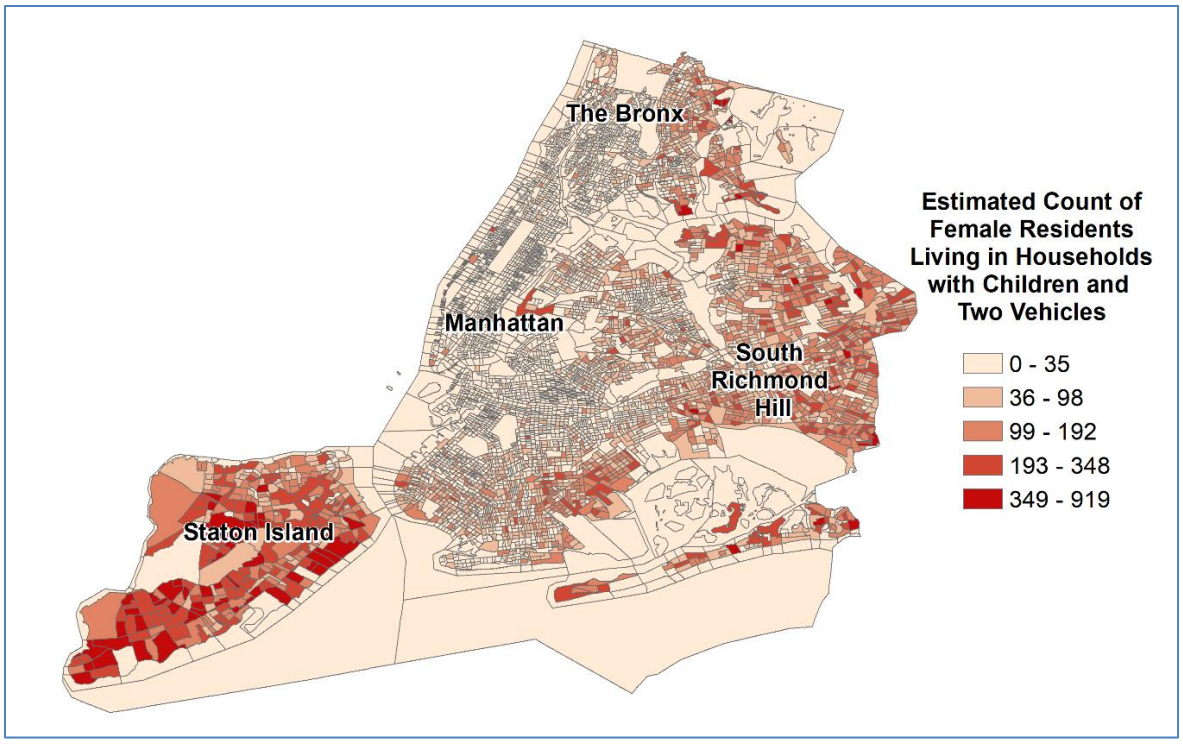
Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.

Figure 12. Estimated counts of nonzero NYC home to work commuting flows originating from a block group in Manhattan



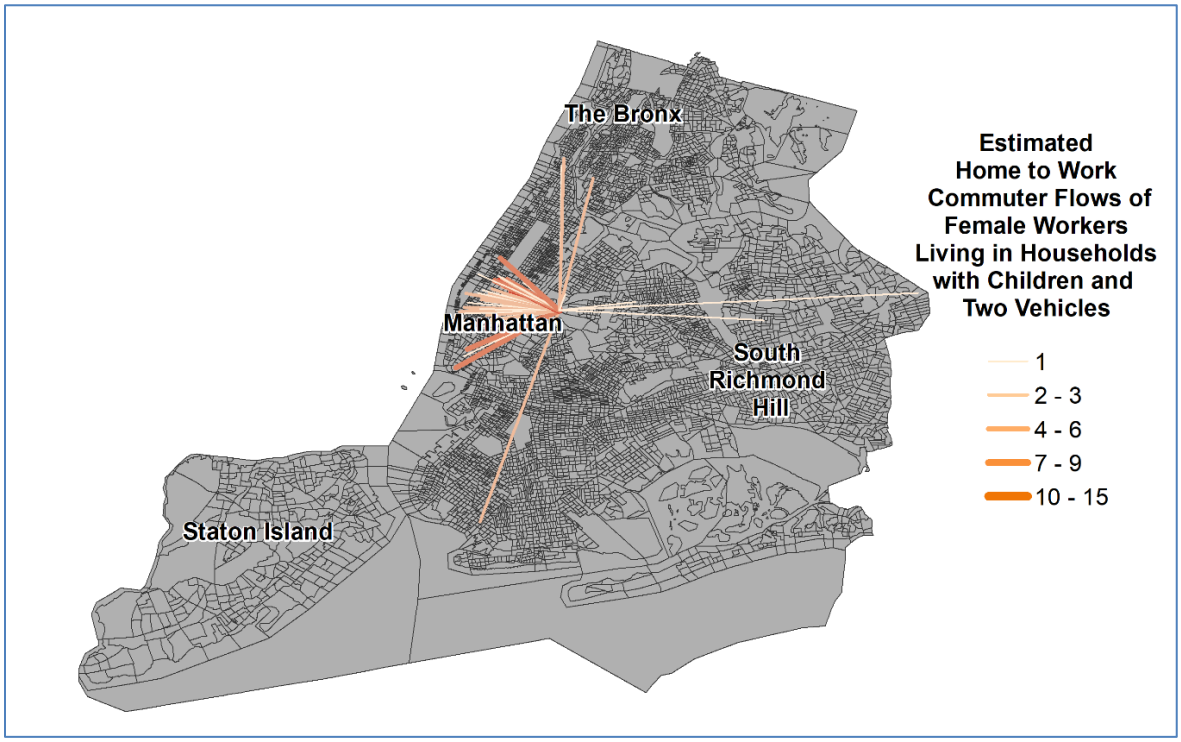
Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.
Note: The estimates represent the number of workers in their work block groups.

Figure 13. Estimated counts of workers in NYC block groups



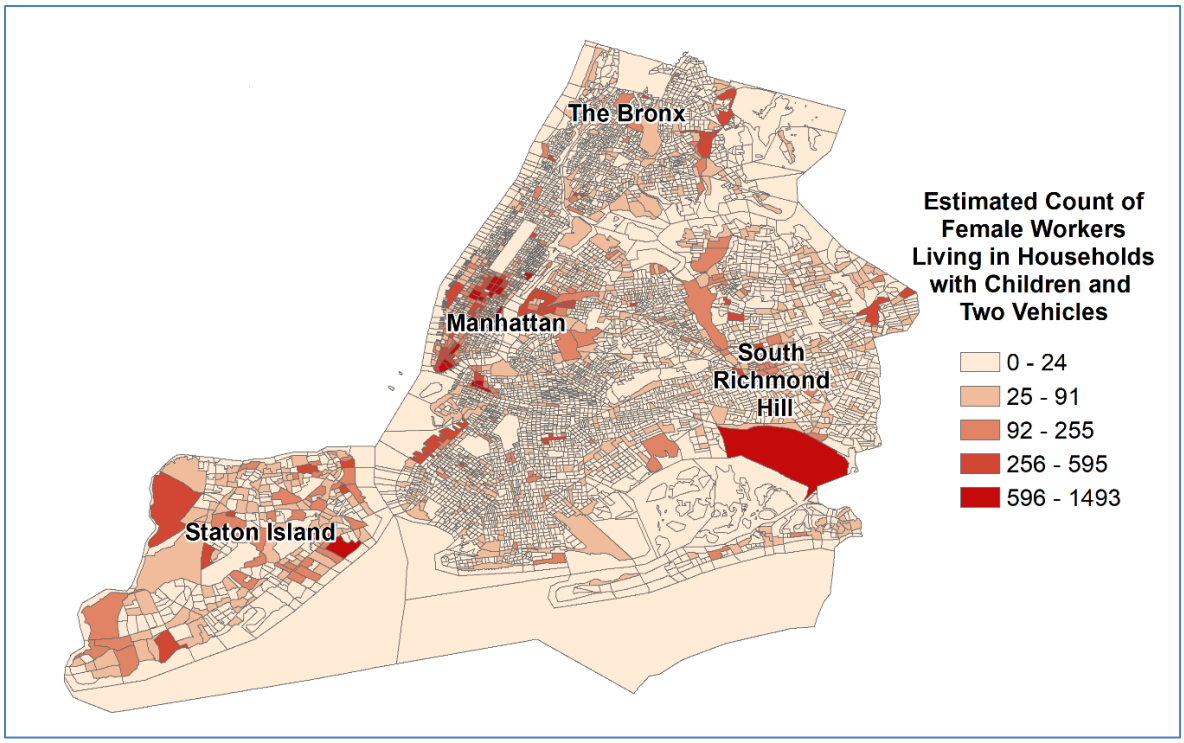
Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.

Figure 14. Estimated counts of female residents living in households with two vehicles and children for all NYC block groups



Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.
Note: All commuting flows originate from a block group near Manhattan.

Figure 15. Estimated counts of nonzero NYC home to work commuting flows for female residents living in households with two vehicles and children



Data source: 2006–2010 CTPP and Pitney Bowes 2010 employment data.
Note: The estimates represent the number of workers in their work block groups.

Figure 16. Estimated counts for all NYC block groups of female workers living in households with two vehicles and children

Understanding the Effects of Policy on Mode Choice Change

Using the obtained synthetic population, including the demographic information and residential and workplace locations of each simulated individual in New York City, we conducted a high-resolution agent-based simulation to analyze the effects of traffic safety, walk-bike network facilities, and land use attributes on simulated walk and bicycle commuting mode choice decisions. New York City is represented by 6,481 census block groups. The synthetic population contains information for 2,953,329 commuters who reside in a census block group and work in another (or the same) census block group. The agent-based simulation computed daily commute mode choices of each of these commuters over one year and aggregated the results. To understand the effects of policy changes on commute mode choices, for this work, we evaluated two scenarios: 1) infrastructure improvement, and 2) reduction of walk- or bicycle-related accidents. In each scenario, changes were made at the census tract level, but the impacts were studied at the census block group level. Figure 17 shows changes (in terms of percentages) in walk and bike mode choices for four scenarios:

1. Average sidewalk width is increased by 12 percent.
2. Accidents involving pedestrians are decreased by 25 percent.
3. The total bike line length is increased by 12 percent.
4. Accidents involving bikers are decreased by 25 percent.

The results show the policy treatments lead to different levels of impact in each of the five boroughs. However, it is clear from the results that infrastructure improvement and perception of safety play important roles in promoting active mode choices.

Figure 17a. Change of walk mode choices with two strategies: SW12: Increasing average sidewalk width by 12%; WLCRSH25: Reducing pedestrian crashes by 25%

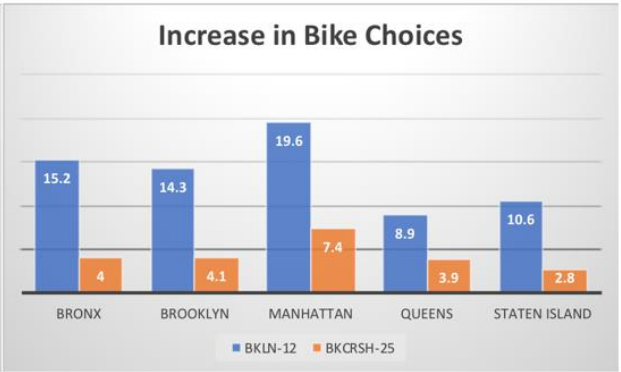


Figure 17b. Change of bike mode choices with two strategies: BKLN12: Increasing total bike lane length by 12%; BKCRSH24: Reducing bike crashes by 25%

In this article, we summarized a high-resolution simulation approach to generating a synthetic population with rich demographic information and spatially explicit residential and workplace locations for census block groups in New York City. In addition, we explained how these data were used to simulate and understand the effects of policy on commute mode choices. For our future work, we next plan to apply the procedure to other major cities, such as Chicago and Dallas, to understand factors behind transportation mode choices given different demographic, industrial, and infrastructure scenarios.

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CTPP website: http://www.fhwa.dot.gov/planning/census_issues/ctpp/
FHWA website for Census issues: http://www.fhwa.dot.gov/planning/census_issues
AASHTO website for CTPP: http://ctpp.transportation.org
1990 and 2000 CTPP data downloadable via Transtats: http://transtats.bts.gov/
TRB Subcommittee on census data: http://www.trbcensus.com

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CTPP Listserv

The CTPP Listserv serves as a web-forum for posting questions, and sharing information on Census and ACS. Currently, more than 700 users are subscribed to the listserv. To subscribe, please register by completing a form posted at: http://www.chrispy.net/mailman/listinfo/ctpp-news.

On the form, you can indicate if you want emails to be batched in a daily digest. The website also includes an archive of past emails posted to the listserv.